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EXAMINER	
CROW, ROBERT THOMAS	
ART UNIT	**PAPER NUMBER**
1634	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/16/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/821,239	JOYCE, TIMOTHY H.	
	Examiner	Art Unit	
	Robert T. Crow	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20 and 30-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20 and 30-53* is/are rejected.

7)☒ Claim(s) *31-33,36,41,46 and 47* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

FINAL ACTION

Status of the Claims

1. This action is in response to papers filed 7 November 2006 in which claims 1-20 and 30-53 were amended, no claims were canceled, and no new claims were added. All of the amendments have been thoroughly reviewed and entered.

A. The previous objections to the specification in the previous Office Action are withdrawn in view of the amendments.

B. The previous rejections under 35 U.S.C. 112, second paragraph, not reiterated below are withdrawn in view of the amendments.

C. Applicant's amendment to remove the means-plus-function language from claim 6 is acknowledged; however, amended claim 20 still recites means-plus-function language.

It is noted that claims 6 and 20 have **not** been rejected under 35 U.S.C. 112, sixth paragraph; rather, interpretation of the means were not limited to specific structures because explicit definitions of the specific structures of the means were not found in the specification. Claim 20, therefore, is not being treated under 35 U.S.C. 112, sixth paragraph for the reasons stated in the previous Office Action.

D. The previous rejections under 35 U.S.C. 102(b) and 35 U.S.C. 103(a) not reiterated below are withdrawn in view of the amendments. Applicant's arguments have been thoroughly reviewed and are addressed following the rejections necessitated by the amendments.

E. The previous rejections under the judicially created doctrine of obviousness-type double patenting are **maintained** for the reasons set forth in the previous Office Action.

F. Claims 1-20 and 30-53 are under prosecution.

Claim Objections

2. Claims 31-33, 36, 41, and 46-47 are objected to because of the following informalities:

The amendments to correct the dependency of the claims are not compliant with 37 CFR 1.121 because the changes have not properly indicated new text by underlining or by indicating deleted text either by striking through or placing it in brackets. For example, the previous version of claim 31 recited "in claim 33" in line 1. The present amendment recites "in claim 303" in line 1. The first "3" is underlined to indicate it is new text; however, it was present in the previous version of the claims. Hence, claims 31-33, 36, 41, and 46-47 each contain text that is underlined but was present in the previous version of the claims.

Appropriate correction is required. See MPEP § 714 [R-5].

3. It is emphasized that Applicant's response filed 7 November 2006 has been considered in the interest of customer service and compact prosecution. While the Examiner has made every attempt to check the claims for compliance with 37 CFR 1.121, Applicant is **required** to carefully check all of the original and amended claims for any and all issues regarding compliance with 37 CFR 1.121.

For the response to this Office Action to be complete, Applicant is **REQUIRED** to correct the errors listed above and file amendments that are compliant with 37 CFR 1.121. Failure to comply with this requirement will be considered **nonresponsive**.

Claim Rejections - 35 USC § 112 First Paragraph

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 4 and 34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the

specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 4 and 34 each recite a third substrate. However, the specification does not teach a third substrate. Therefore, the addition of a third substrate in the claims constitutes new matter.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-8, 13-14, 17-18, 20, and 30-36 are rejected under 35 U.S.C. 102(b) as being anticipated by Wang et al (U.S. Patent Application Publication No. US 2002/0182627 A1, published 5 December 2002).

Regarding claim 1, Wang et al teach an apparatus for identifying a chemical moiety from a sample solution. In a single exemplary embodiment, Wang et al teach a microfluidic device comprising a channel in a substrate (paragraphs 0062 and 0408 and Figures 13 and 21), and having a proteomics unit or genomics unit (paragraphs 0411-412), which is at least one array for capturing and releasing a chemical moiety from a sample solution. Wang et al also teach a solid state nanopore system downstream from the substrate; namely, Figure 21, wherein the first chamber is a proteomics or genomics unit (i.e., any appropriate test takes place in the first chamber), and the sample is transported from the first chamber to an ion transport detection unit (paragraph 0408). The ion transport detection unit receives the samples from the first chamber (paragraph 0408 and Figure 21), thus identifying the chemical moiety received from the substrate channels after the chemical moiety has been released from the array.

The nanopore system of Wang et al comprises a spiral electrode structure wherein the electrodes are circular (i.e., rings; paragraphs 0038, 0128, and Figure 3B) and the second electrode 61 of Figure 10,

wherein the electrodes are circular (i.e., rings; paragraphs 0059 and 0128). Wang et al further teach a nanopore adjacent to the first ring electrode and the second ring electrode and positioned to allow the chemical moiety to be positioned in the first ring electrode and the second ring electrode; namely, hole 12 of Figure 10 (paragraph 0059). Wang et al further teach a voltage source for electrically connecting the first ring electrode to the second ring electrode for applying a ramping potential from the first ring electrode, through a portion of the chemical moiety in the nanopore to a second ring electrode to produce a signal indicative of a portion of the chemical moiety; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (paragraph 0342).

Regarding claims 2-3, Wang et al teach the apparatus of claim 1, further comprising a second substrate for positioning the first ring electrode and the second ring electrode; namely; Wang et al teach Figure 18A. Figure 18A shows a first substrate on having top channel 192, wherein the first substrate is the material on top of barrier 190. The second substrate is the remainder of the structure of Figure 18A, which has first ring electrode 191 and a second ring electrode; namely, the second ring electrode is the "box" on layer 198 beneath aperture 195 (paragraph 0395). The boxes are the electrodes of Wang et al by analogy to box 191, which is an electrode. The electrodes are circular (i.e., rings; paragraphs 0059 and 0128).

It is noted that claim 3 requires a third substrate, and is dependent upon claim 1, which requires a first substrate. Claim 3 therefore does not require a second substrate; thus, the second substrate of claim 2 and the third substrate of claim 3 are equivalent.

Regarding claim 4, Wang et al teach the apparatus of claim 1, further comprising at least a third substrate for positioning the second ring electrode. It is noted that claim 3, which requires a third substrate, is dependent upon claim 1, which requires a first substrate. Therefore, no second substrate is required. Wang et al teach Figure 18A, which shows a first substrate on having top channel 192, wherein

the first substrate is the material on top of barrier 190. The second substrate is barrier 196, which has the nanopore (paragraph 0395). .

Regarding claim 5, Wang et al teach the apparatus of claim 1, further comprising at least a second substrate for positioning a nanopore; namely, namely; Wang et al teach Figure 18A. Figure 18A shows a first substrate on having top channel 192, wherein the first substrate is the material on top of barrier 190. The second substrate is the remainder of the structure of Figure 18A, which has first ring electrode 191 and a second ring electrode; namely, the second ring electrode is the "box" on layer 198 beneath aperture 195 (paragraph 0395). The boxes are the electrodes of Wang et al, and are circular (i.e., rings; paragraphs 0059 and 0128).

Regarding claim 6, Wang et al teach the apparatus of claim 1, further comprising a means for signal detection for detecting the signal produced from the portion of the biopolymer; namely, an ion transport detection unit (paragraph 0408).

Regarding claim 7, Wang et al teach the apparatus of claim 1, wherein the channel is a microfluidic channel (paragraph 0080).

Regarding claim 8, Wang et al teach the apparatus of claim 1, wherein the array comprises a probe; namely, the array is a genomics unit that includes structures [i.e., probes] for ex vivo hybridization to nucleic acids; paragraph 0412).

Regarding claim 13, Wang et al teach the apparatus of claim 1, wherein the substrate comprises glass (paragraph 0026).

Regarding claim 14, Wang et al teach the apparatus of claim 7, wherein the dimension of the micro fluidic channel is 100 microns or less; namely, the conduits, which are channels, are 10 microns (paragraph 0114).

Regarding claim 17, Wang et al teach the apparatus of claim 1, wherein the substrate is rigid; namely, glass (paragraph 0026).

Regarding claim 18, Wang et al teach the apparatus of claim 1, which further comprises at least one valve in the channel that permit different fluids to be directed into the channel (paragraph 0402).

Regarding claim 20, Wang et al teach the apparatus of claim 1, which further comprises means to move the fluids through the array; namely, the chambers are fed by pumps (paragraph 0195).

Regarding claim 30, Wang et al teach an apparatus for identifying a chemical moiety from a sample solution. In a single exemplary embodiment, Wang et al teach a microfluidic device comprising a substrate having a channel (paragraphs 0062 and 0408 and Figures 13 and 21), and having a proteomics unit or genomics unit (paragraphs 0411-412), which is at least one array. Wang et al also teach a solid state nanopore system downstream from the substrate; namely, Figure 21, wherein the first chamber is a proteomics or genomics unit (i.e., any appropriate test takes place in the first chamber), and the sample is transported from the first chamber to an ion transport detection unit (paragraph 0408). The ion transport detection unit receives the samples from the first chamber (paragraph 0408 and Figure 21), thus identifying the chemical moiety received from the substrate channels after the chemical moiety has been released from the array.

The nanopore system of Wang et al comprises a first electrode having a first nanopore; namely, a spiral electrode structure surrounding a hole in the substrate, wherein the electrodes are circular (paragraphs 0038 and 0128, and Figure 3B). Wang et al also teach a second electrode adjacent to the first electrode; namely, the second electrode 61 of Figure 10 (paragraph 0059), which has a second nanopore because the electrodes are circular (i.e., rings; paragraph 0128) and surrounds the bottom of the hole in the substrate (Figure 10). The first nanopore of the first electrode is positioned with the second nanopore of the second electrode so that the chemical moiety may translocate through the first nanopore and the second nanopore; namely, the hole that is surrounded by the electrodes is used as an ion transport channel (paragraph 0077). Wang et al further teach a voltage source for electrically connecting the first electrode to the second electrode for applying a ramping potential from the first electrode, through a portion of the chemical moiety in the nanopore to a second electrode to produce a signal indicative of a

portion of the chemical moiety; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (paragraph 0342).

Regarding claim 31, Wang et al teach the apparatus of claim 30, wherein the first and second nanopores have center points and wherein the center point of the first nanopore is positioned coaxially with the center point of the second electrode; namely, the hole in the substrates is at the center of the circular electrode elements (paragraph 0239).

Regarding claim 32, Wang et al teach the apparatus of claim 30, wherein the first electrode is positioned above the second electrode; namely, electrode 60 is above electrode 61 in Figure 10.

Regarding claims 33-34, Wang et al teach the apparatus of claim 30, further comprising a second substrate for positioning the first electrode and the second electrode and a third substrate for positioning the second electrode; namely; Wang et al teach Figure 18A. Figure 18A shows a first substrate in the form of substrate 198, which comprises bottom channel 194. Figure 18A also comprises a second substrate in the form of barrier 196, which has first electrode 191 thereon. Second substrate 196 therefore positions first electrode 191. Second substrate 196 also creates bottom channel 194, wherein the second electrode is the "box" on substrate 198 beneath aperture 195 (paragraph 0395). The boxes are the electrodes of Wang et al by analogy to box 191, which is an electrode. Bottom channel 194 is also defined by the unmarked third substrate sandwiched between first substrate 198 and second substrate 196. Thus, the second electrode is positioned in channel 194 by first substrate 198, second substrate 196, and the unmarked and sandwiched third substrate

It is noted that the specification does not provide any limiting definition of the word "positioning." Thus, the claim has been given the broadest reasonable interpretation consistent with the specification (*In re Hyatt*, 211 F.3d1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000) (see MPEP 2111 [R-1]).

Regarding claim 35, Wang et al teach an apparatus for identifying a chemical moiety from a sample solution. In a single exemplary embodiment, Wang et al teach a microfluidic device comprising a substrate having a channel (paragraphs 0062 and 0408 and Figures 13 and 21), and having a proteomics unit or genomics unit (paragraphs 0411-412), which is at least one array for capturing a chemical moiety from a sample solution. Wang et al also teach a solid state nanopore system downstream from the substrate; namely, Figure 21, wherein the first chamber is a proteomics or genomics unit (i.e., any appropriate test takes place in the first chamber), and the sample is transported from the first chamber to an ion transport detection unit (paragraph 0408). The ion transport detection unit receives the samples from the first chamber (paragraph 0408 and Figure 21), thus identifying the chemical moiety received from the substrate channels after the chemical moiety has been released from the array.

The nanopore system of Wang et al comprises a first electrode; namely, a spiral electrode structure surrounding a hole in the substrate (paragraph 0038 and Figure 3B), wherein the electrodes are circular (paragraph 0128) Wang et al also teach a second electrode spaced from the first electrode to define a nanopore between the first electrode and the second electrode; namely, the second electrode 61 of Figure 10 (paragraph 0059), wherein the electrodes are circular (paragraph 0128) and surround the bottom of the hole in the substrate (Figure 10), thereby defining the nanopore. The nanopore is designed for receiving a translocating chemical moiety because the hole that is surrounded by the electrodes is used as an ion transport channel (paragraph 0077). The first electrode is in electrical connection with the second electrode via electrical connection leads from the electrodes connect to a measuring device; paragraph 0058). Wang et al also teach a voltage source for electrically connecting the first electrode to the second electrode for applying a ramping potential from the first electrode, through a portion of the chemical moiety in the nanopore to a second electrode to produce a signal indicative of a portion of the chemical moiety; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (paragraph 0342).

Regarding claim 36, Wang et al teach the apparatus of claim 35, wherein the biopolymer is translocated in a stepwise fashion through the nanopore defined between the first electrode and the second electrode; namely, Wang et al teach Figure 7, wherein a particle first engages the hole then is moved into the hole (paragraphs 0053-0054).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1, 8-9, 15, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (U.S. Patent Application Publication No. US 2002/0182627 A1, published 5 December 2002) in view of Yasuda et al (U.S. Patent No. 6,218,126 B1, issued 17 April 2001).

Regarding claims 9, 15, and 19, Wang et al teach the apparatus of claim 1 for identifying a chemical moiety from a sample solution. In a single exemplary embodiment, Wang et al teach a microfluidic device comprising a channel in a substrate (paragraphs 0062 and 0408 and Figures 13 and 21), and having a proteomics unit or genomics unit (paragraphs 0411-412), which is at least one array for capturing and releasing a chemical moiety from a sample solution. Wang et al also teach a solid state nanopore system downstream from the substrate; namely, Figure 21, wherein the first chamber is a proteomics or genomics unit (i.e., any appropriate test takes place in the first chamber), and the sample is transported from the first chamber to an ion transport detection unit (paragraph 0408). The ion transport detection unit receives the samples from the first chamber (paragraph 0408 and Figure 21), thus identifying the chemical moiety received from the substrate channels after the chemical moiety has been released from the array.

The nanopore system of Wang et al comprises a spiral electrode structure wherein the electrodes are circular (i.e., rings; paragraphs 0038, 0128, and Figure 3B) and the second electrode 61 of Figure 10, wherein the electrodes are circular (i.e., rings; paragraphs 0059 and 0128). Wang et al further teach a nanopore adjacent to the first ring electrode and the second ring electrode and positioned to allow the chemical moiety to be positioned in the first ring electrode and the second ring electrode; namely, hole 12 of Figure 10 (paragraph 0059). Wang et al further teach a voltage source for electrically connecting the first ring electrode to the second ring electrode for applying a ramping potential from the first ring electrode, through a portion of the chemical moiety in the nanopore to a second ring electrode to produce a signal indicative of a portion of the chemical moiety; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (paragraph 0342).

Wang et al also teach the apparatus of claim 8, wherein the array comprises a probe; namely, the array is a genomics unit that includes structures [i.e., probes] for ex vivo hybridization to nucleic acids (paragraph 0412).

While Wang et al teach the array is a genomics unit that includes structures (i.e., probes) for ex vivo hybridization to nucleic acids (paragraph 0412), and that the preferred targets are biomolecules (paragraph 0429), Wang et al do not explicitly teach the probes or targets are nucleic acids. Wang et al are also silent with respect to temperature control.

However, Yasuda et al teach an apparatus (Title) comprising an array of complementary polynucleotide probes (i.e., the nucleic acid probes of claim 9) immobilized on a substrate (Abstract and Figure 3) with the added advantage that polynucleotide probes allows selective extraction of a target polynucleotide alone from a sample solution (column 2, lines 25-27). Yasuda et al also teach having mRNA as targets (i.e., the targets of claim 15) with the further added advantage that polynucleotide targets are quantitatively determined to allow clarification of a condition in a white blood cell (column 21, lines 33-41). Yasuda et al also teach an infrared laser source (i.e., the temperature control

of claim 19; column 6, lines 4-35) with the additional added advantage that the temperature control device allows selective separation of a hybridized target polynucleotide from a probe on a specific area (column 6, lines 30-35).

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the apparatus comprising the probe array as taught by Wang et al with the nucleic acid probes, oligonucleotide targets, and temperature control as taught by Yasuda et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make each of the modifications because said modifications would have resulted in an apparatus that selectively extracts only a target polynucleotide from a sample solution, performs quantitative determination to allow clarification of a condition in a white blood cell, and selectively separates a hybridized target polynucleotide from a probe on a specific area as explicitly taught by Yasuda et al (column 2, lines 25-27, column 21, lines 33-41, and column 6, lines 30-35).

10. Claims 1, 8, 10, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (U.S. Patent Application Publication No. US 2002/0182627 A1, published 5 December 2002) in view of Chin et al (U.S. Patent No 6,197,599 B1, issued 6 March 2001).

Regarding claims 10 and 16, Wang et al teach the apparatus of claim 1 for identifying a chemical moiety from a sample solution. In a single exemplary embodiment, Wang et al teach a microfluidic device comprising a channel in a substrate (paragraphs 0062 and 0408 and Figures 13 and 21), and having a proteomics unit or genomics unit (paragraphs 0411-412), which is at least one array for capturing and releasing a chemical moiety from a sample solution. Wang et al also teach a solid state nanopore system downstream from the substrate; namely, Figure 21, wherein the first chamber is a proteomics or genomics unit (i.e., any appropriate test takes place in the first chamber), and the sample is transported from the first chamber to an ion transport detection unit (paragraph 0408). The ion transport detection unit

receives the samples from the first chamber (paragraph 0408 and Figure 21), thus identifying the chemical moiety received from the substrate channels after the chemical moiety has been released from the array.

The nanopore system of Wang et al comprises a spiral electrode structure wherein the electrodes are circular (i.e., rings; paragraphs 0038, 0128, and Figure 3B) and the second electrode 61 of Figure 10, wherein the electrodes are circular (i.e., rings; paragraphs 0059 and 0128). Wang et al further teach a nanopore adjacent to the first ring electrode and the second ring electrode and positioned to allow the chemical moiety to be positioned in the first ring electrode and the second ring electrode; namely, hole 12 of Figure 10 (paragraph 0059). Wang et al further teach a voltage source for electrically connecting the first ring electrode to the second ring electrode for applying a ramping potential from the first ring electrode, through a portion of the chemical moiety in the nanopore to a second ring electrode to produce a signal indicative of a portion of the chemical moiety; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (paragraph 0342).

Wang et al also teach the apparatus of claim 8, wherein the array comprises a probe; namely, the array is a genomics unit that includes structures [i.e., probes] for ex vivo hybridization to nucleic acids (paragraph 0412).

Wang et al teach the apparatus comprises protein probes; namely, a proteomics unit comprising antigen-antibody reactions (paragraph 0411). Wang et al do not specifically teach an array of protein probe molecules, and are silent with respect to the number of features on the array.

However, Chin et al teach a protein array in the form of a solid support comprising multiple immobilized proteins (Abstract), which has the added advantage of revealing disease mechanisms (column 3, lines 4-22). Chin et al teach also teach the array comprises more that 100 features (column 10, lines 25-30) with the additional added advantage that large numbers of antibodies (i.e., features) allow the study of a wide variety of protein in a single experiment (column 2, line 67-column 3, line 3).

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the apparatus as taught by Wang et al with the protein array comprising more that 100 features as taught by Chin et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make each of the modifications because said modifications would have resulted in allowing the study of a wide variety of protein in a single experiment as explicitly taught by Chin et al (column 2, line 67-column 3, line 3).

11. Claims 1, 8, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (U.S. Patent Application Publication No. US 2002/0182627 A1, published 5 December 2002) in view of Denong Wang (PCT International Publication No. WO 02/083918A2, published 24 October 2002) as evidenced by Wade (Organic Chemistry, 2nd ed., Prentice-Hall, Englewood Cliffs, NJ (1997), page 1045).

Regarding claims 11 and 12, Wang et al teach the apparatus of claim 1 for identifying a chemical moiety from a sample solution. In a single exemplary embodiment, Wang et al teach a microfluidic device comprising a channel in a substrate (paragraphs 0062 and 0408 and Figures 13 and 21), and having a proteomics unit or genomics unit (paragraphs 0411-412), which is at least one array for capturing and releasing a chemical moiety from a sample solution. Wang et al also teach a solid state nanopore system downstream from the substrate; namely, Figure 21, wherein the first chamber is a proteomics or genomics unit (i.e., any appropriate test takes place in the first chamber), and the sample is transported from the first chamber to an ion transport detection unit (paragraph 0408). The ion transport detection unit receives the samples from the first chamber (paragraph 0408 and Figure 21), thus identifying the chemical moiety received from the substrate channels after the chemical moiety has been released from the array.

The nanopore system of Wang et al comprises a spiral electrode structure wherein the electrodes are circular (i.e., rings; paragraphs 0038, 0128, and Figure 3B) and the second electrode 61 of Figure 10, wherein the electrodes are circular (i.e., rings; paragraphs 0059 and 0128). Wang et al further teach a nanopore adjacent to the first ring electrode and the second ring electrode and positioned to allow the

chemical moiety to be positioned in the first ring electrode and the second ring electrode; namely, hole 12 of Figure 10 (paragraph 0059). Wang et al further teach a voltage source for electrically connecting the first ring electrode to the second ring electrode for applying a ramping potential from the first ring electrode, through a portion of the chemical moiety in the nanopore to a second ring electrode to produce a signal indicative of a portion of the chemical moiety; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (paragraph 0342).

Wang et al also teach the apparatus of claim 8, wherein the array comprises a probe; namely, the array is a genomics unit that includes structures [i.e., probes] for ex vivo hybridization to nucleic acids (paragraph 0412).

While Wang et al teach the apparatus comprises probes in the form of a proteomics unit comprising antigen-antibody reactions (paragraph 0411), Wang et al do not specifically teach an array of carbohydrate or polysaccharide probe molecules.

Wade et al define polysaccharides as carbohydrates (page 1045, line 1); therefore, a polysaccharide probe is also a carbohydrate probe.

Denong Wang teaches an array of purified polysaccharides (i.e., polysaccharide probes) having the added advantage that purified polysaccharides are stable in various conditions and do not denature or undergo conformational alteration (page 73, line 30-page 74, line 4).

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the apparatus as taught by Wang et al with the array comprising polysaccharide probes as taught by Denong Wang with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted an array having probes that are stabile to various conditions and do not denature or undergo conformational alteration as explicitly taught by Denong Wang (page 73, line 30-page 74, line 4).

12. Claims 37-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (U.S. Patent Application Publication No. US 2002/0182627 A1, published 5 December 2002) in view of Ootsubo et al ((U.S. Patent Application Publication No. US 2003/0087297 A1, published 8 May 2003).

Regarding claims 37-51, Wang et al teach an apparatus for identifying a chemical moiety from a sample solution. In a single exemplary embodiment, Want et al teach a microfluidic device comprising a substrate having a channel (paragraphs 0062 and 0408 and Figures 13 and 21), and having a proteomics unit or genomics unit (paragraphs 0411-412), which is at least one array for capturing a chemical moiety from a sample solution. Wang et al also teach a solid state nanopore system downstream from the substrate; namely, Figure 21, wherein the first chamber is a proteomics or genomics unit (i.e., any appropriate test takes place in the first chamber), and the sample is transported from the first chamber to an ion transport detection unit (paragraph 0408). The ion transport detection unit receives the samples from the first chamber (paragraph 0408 and Figure 21), thus identifying the chemical moiety received from the substrate channels after the chemical moiety has been released from the array.

The nanopore system of Wang et al comprises a first electrode layer having a first portion of the nanopore extending there through; namely, a spiral electrode structure surrounding a hole in the substrate wherein the electrodes are circular and the hole is a funnel (paragraphs 0035, 0038, and 0128, and Figures 2E and 3B). The electrode is exposed and defines an edge because the electrode edges are accessible to particles (paragraph 0273). Wang et al also teach a first layer adjacent the first electrode layer; namely, the substrate is multilayered (paragraph 0186), and the first layer has a second portion of the nanopore there through, the first layer edge overhanging the first electrode edge because the hole extends through the layers of the substrate and is a funnel (Figure 2E and paragraph 0035). Wang et al also teach a second electrode layer adjacent the to the first layer, the second electrode layer having a third portion of the nanopore there through; namely, the first electrode 60 of Figure 2E (paragraph 0035), wherein the hole extends through the layers and is a funnel (Figure 2E and paragraph 0035) wherein the electrodes are circular (i.e., rings; paragraph 0128) and surround the bottom of the hole in the substrate

(Figure 2E), thereby defining the nanopore. The second electrode is exposed and defines a second electrode edge because the electrode edges are accessible to particles (paragraph 0273). The second electrode edge overhanging the first layer edge because the hole extends through the layers of the substrate and is a funnel (Figure 2E and paragraph 0035);

Wang et al also teach the first electrode and the second electrode may be electrically ramped for sensing the chemical moiety; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (paragraph 0342).

Wang et al also teach a substrate adjacent to the first electrode; namely, the electrodes are provided on separate layers (i.e., claim 38; paragraph 0186), wherein each layer is interpreted as a substrate for these additional structures). Wang et al teach the first electrode edge defines a diameter that is smaller than the second diameter portion that is defined by the first layer edge; namely, the hole extends through the layers of the substrate and is a funnel (i.e., claim 39; Figure 2E and paragraph 0035). Wang et al further teaches a second layer contacting the second electrode layer and being adjacent to the nanopore; namely, the substrate is multilayered (paragraph 0186), the second layer having a fourth portion of the nanopore there through and defining a second edge, the second edge overhanging the second electrode edge because the hole extends through the layers of the substrate and is a funnel (i.e., claim 40; Figure 2E and paragraph 0035).

Wang et al teach the second edge defines a third diameter portion that is smaller than the second diameter portion of the nanopore because the hole extends through the layers of the substrate and is a funnel (i.e., claim 41; Figure 2E and paragraph 0035). Wang et al also teach the first electrode layer and the second electrode layers comprise ring structures; namely, the electrodes are circular (i.e., the rings of claim 42-44; paragraph 0128).

Wang et al teach electric circuits (i.e., claim 45; paragraph 0058), which further comprise a voltage source for electrically connecting the first electrode layer with the second electrode layer and generating a

potential between the first electrode layer and the second layer for sensing a chemical moiety in the nanopore; namely, the electrodes measure ion transport across the hole (paragraph 0341), wherein a feedback capacitor ramps a voltage (paragraph 0345), and the electrical measurements are detected (i.e., claim 46; paragraph 0342). Wang et al also teach the voltage source comprises a time varying voltage source (i.e., claim 47; paragraph 0345).

Wang et al teach a current sensor for sensing a resulting current (i.e., claim 48; paragraph 0342). Wang et al also teach the electrode layers are gold (i.e., claims 49-50; paragraph 0128). Wang et al further teach the pores are from 1 nanometer to 300 nanometers (i.e., claim 51; paragraph 0337).

While Wang et al teach a multilayered substrate (paragraph 0186) and also teach the use of insulating materials (paragraphs 0129 and 0396), Wang et al are silent with respect to an insulating layer between the electrodes.

However, Ootsubo et al teach an apparatus in the form of a biochip (paragraph 0016) having a thin transparent layer of insulation between electrodes with the added advantage that the insulation layer allows the distance between the electrodes to be easily shortened, thereby achieving miniaturization and high speed (paragraph 0042).

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the structure comprising layers between electrodes as taught by Wang et al with the insulation layer between the electrodes as taught by Ootsubo et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in an apparatus that allows the distance between the electrodes to be easily shortened, thereby achieving miniaturization and high speed as explicitly taught by Ootsubo et al (paragraph 0042).

13. Claims 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (U.S. Patent Application Publication No. US 2002/0182627 A1, published 5 December 2002) and Ootsubo et al ((U.S. Patent Application Publication No. US 2003/0087297 A1, published 8 May 2003) as applied to claim 37 above, and further in view of Peters (U.S. Patent No. 4,543,271, issued 24 September 1985).

Regarding claims 52-53, the apparatus of claim 37 is discussed above on pages 16-18. Neither Wang et al or Ootsubo et al teach materials for the insulator layers.

However, Peters teaches the use of silicon dioxide as an insulating layer with the added advantage that a layer of silicon dioxide prevents long-term air oxidation (column 8, lines 57-60).

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to modify the structure as taught by Wang et al and Ootsubo et al with silicon dioxide as taught by Peters with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in a structure that is protected from oxidation even upon long term exposure to air as explicitly taught by Peters (column 8, lines 57-60).

Response to Arguments

14. Applicant's arguments filed 7 November 2006 fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Conclusion

15. No claim is allowed.

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

17. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert T. Crow whose telephone number is (571) 272-1113. The examiner can normally be reached on Monday through Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla can be reached on (571) 272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Robert T. Crow
Examiner
Art Unit 1634

RAM R. SHUKLA, PH.D.
SUPERVISORY PATENT EXAMINER